FIG.1

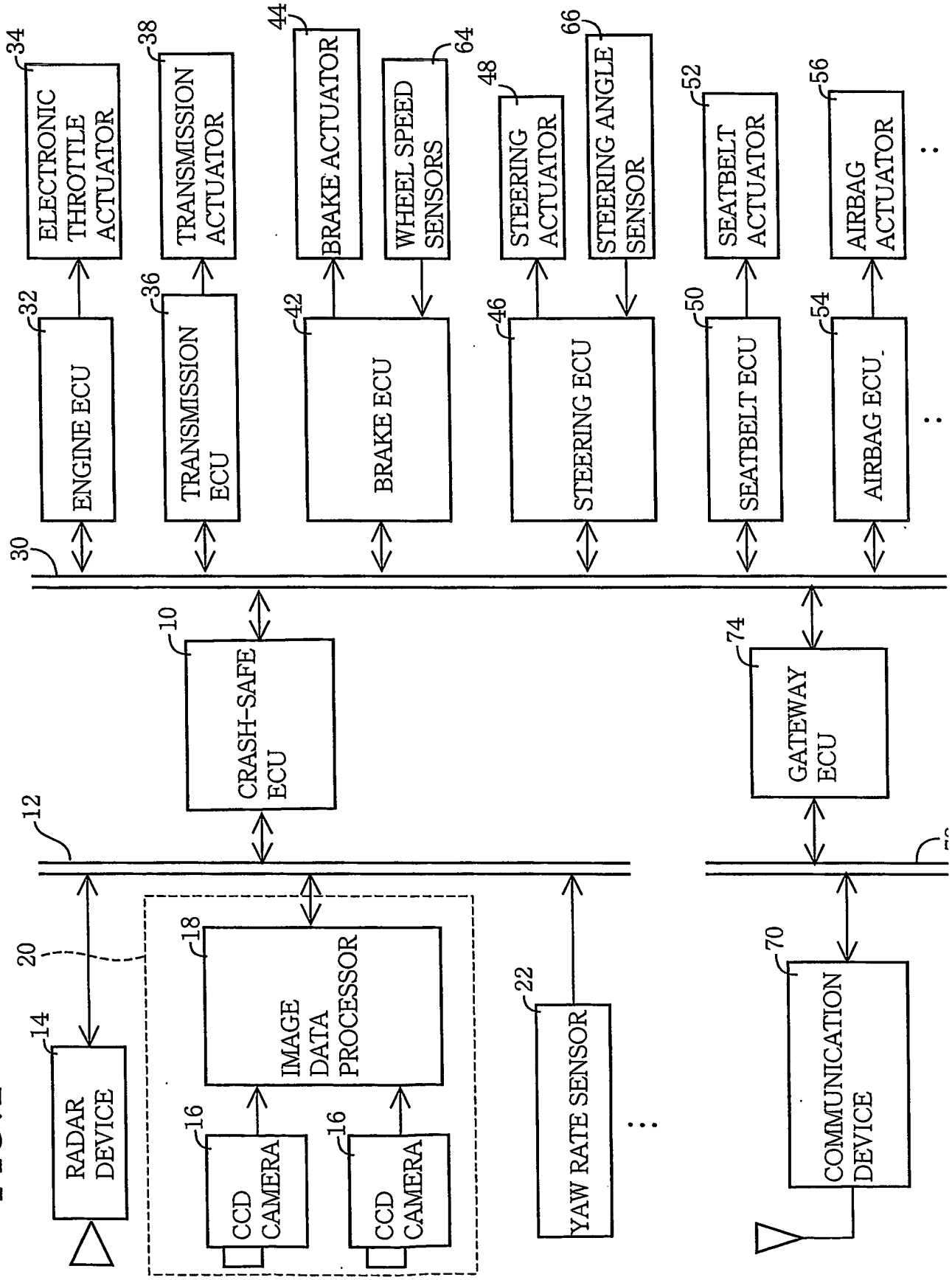

ELECTRONIC THROTTLE ACTUATOR
34
TRANSMISSION ACTUATOR
38
BRAKE ACTUATOR
44
WHEEL SPEED SENSORS
64
STEERING ACTUATOR
48
STEERING ANGLE SENSOR
66
SEATBELT ACTUATOR
52
AIRBAG ACTUATOR
56
ENGINE ECU
32
TRANSMISSION ECU
36
BRAKE ECU
42
STEERING ECU
46
SEATBELT ECU
50
AIRBAG ECU
54
30
CRASH-SAFE ECU
10
GATEWAY ECU
74
12
20
RADAR DEVICE
14
IMAGE DATA PROCESSOR
18
CCD CAMERA
16
CCD CAMERA
16
YAW RATE SENSOR
22
COMMUNICATION DEVICE
70

FIG.2

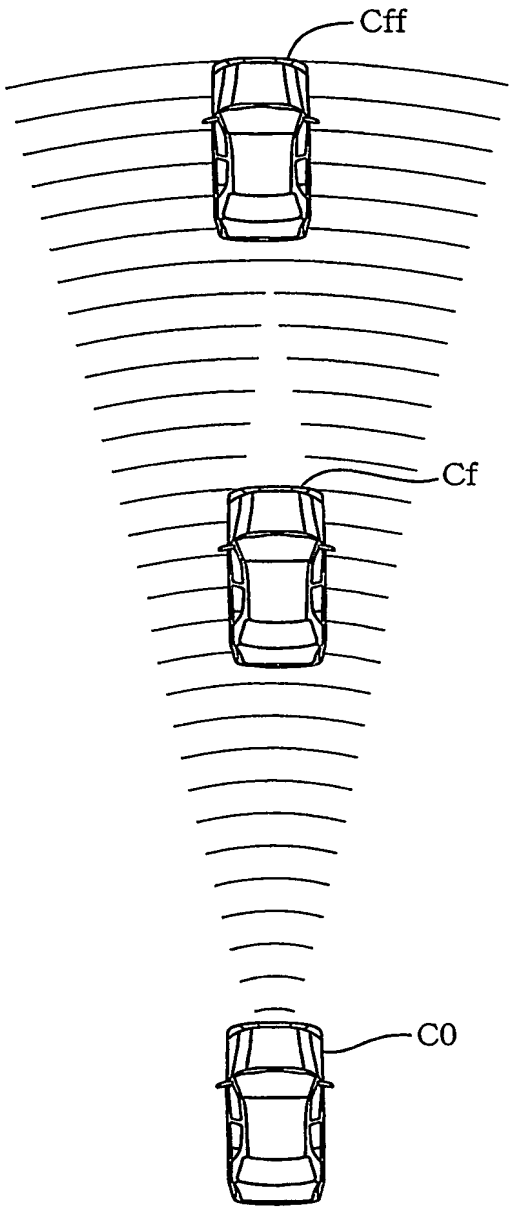


FIG.3

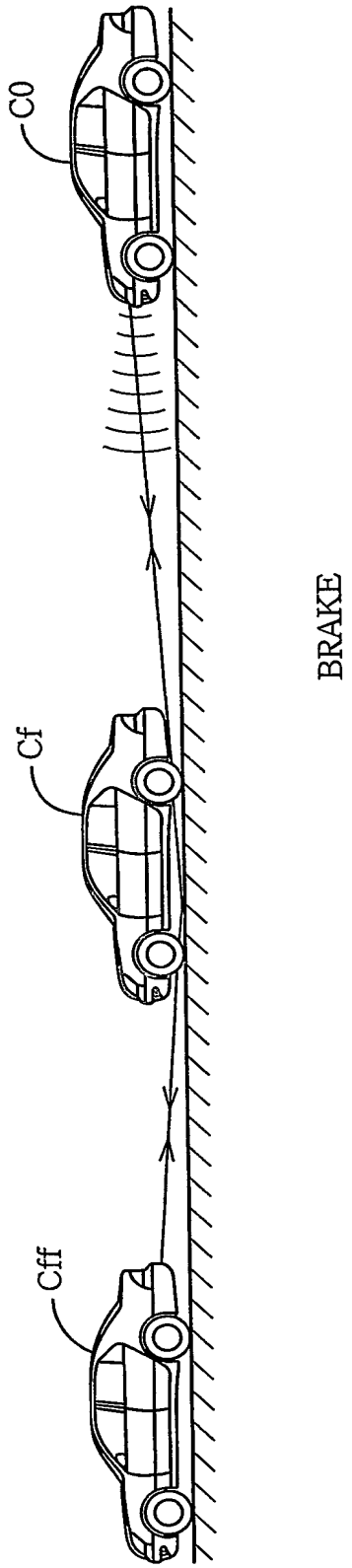


FIG.4

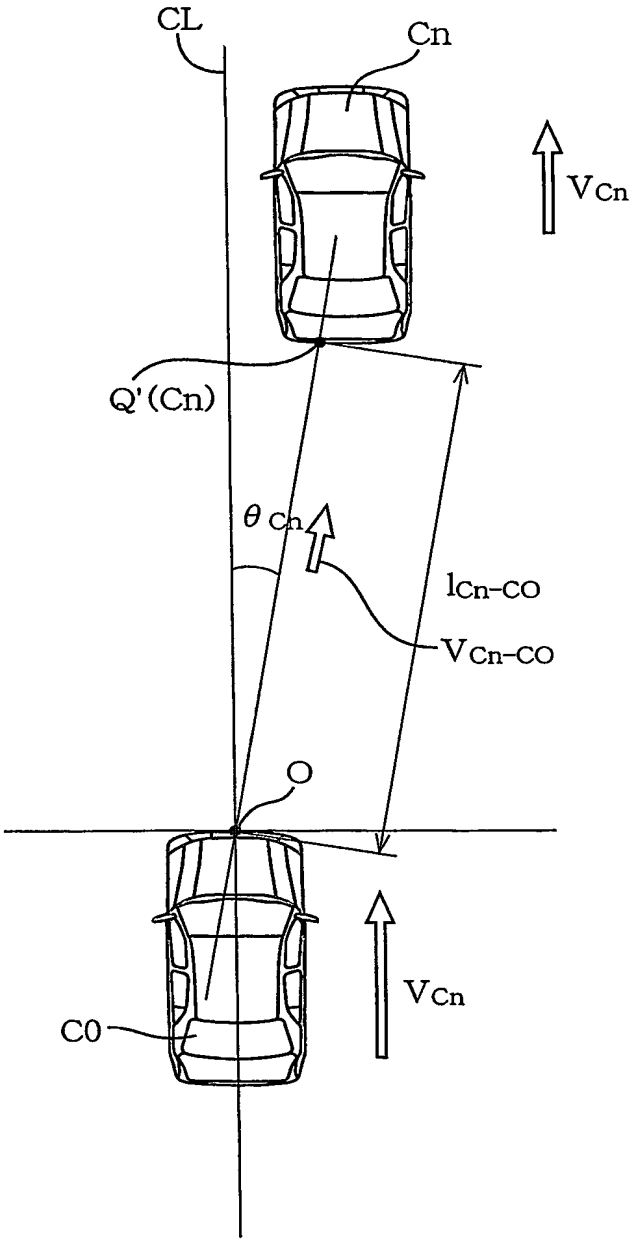


FIG.5

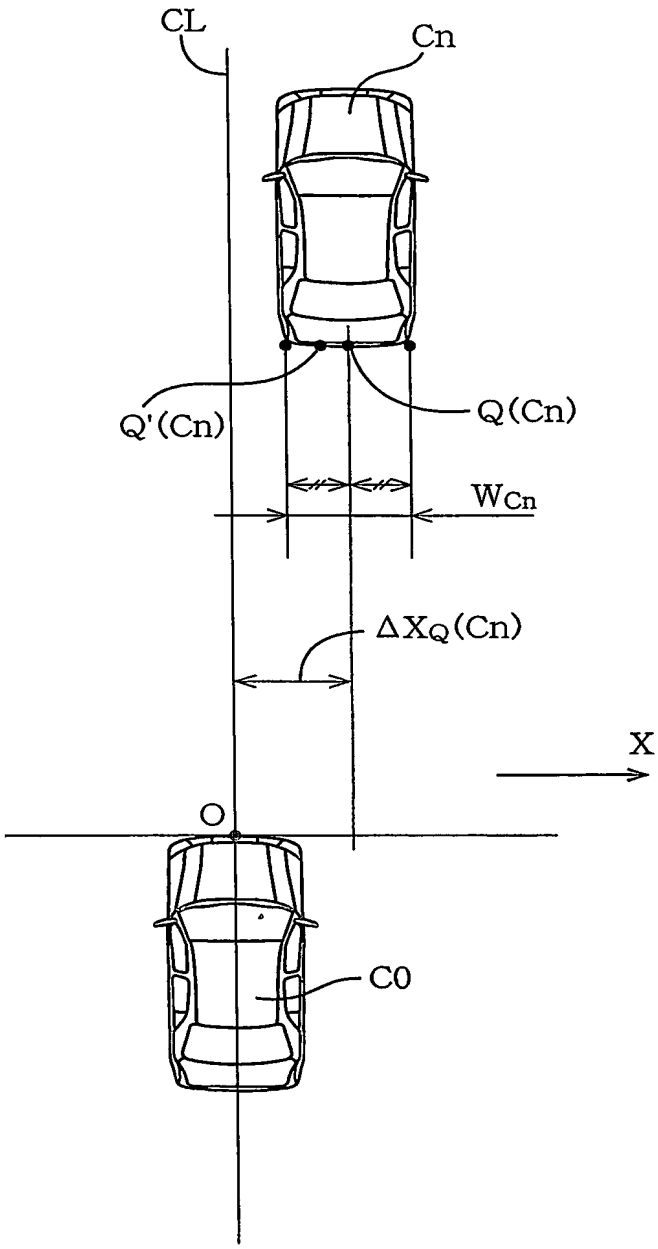


FIG.6

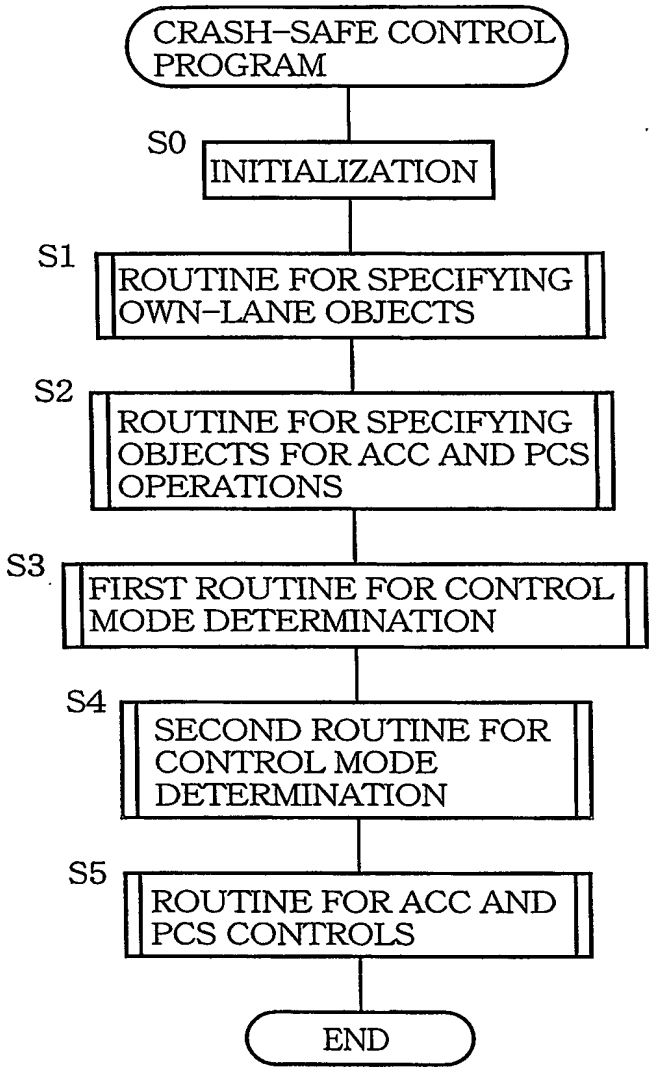

CRASH-SAFE CONTROL PROGRAM
S0
INITIALIZATION
S1
ROUTINE FOR SPECIFYING OWN-LANE OBJECTS
S2
ROUTINE FOR SPECIFYING OBJECTS FOR ACC AND PCS OPERATIONS
S3
FIRST ROUTINE FOR CONTROL MODE DETERMINATION
S4
SECOND ROUTINE FOR CONTROL MODE DETERMINATION
S5
ROUTINE FOR ACC AND PCS CONTROLS
END

FIG.7

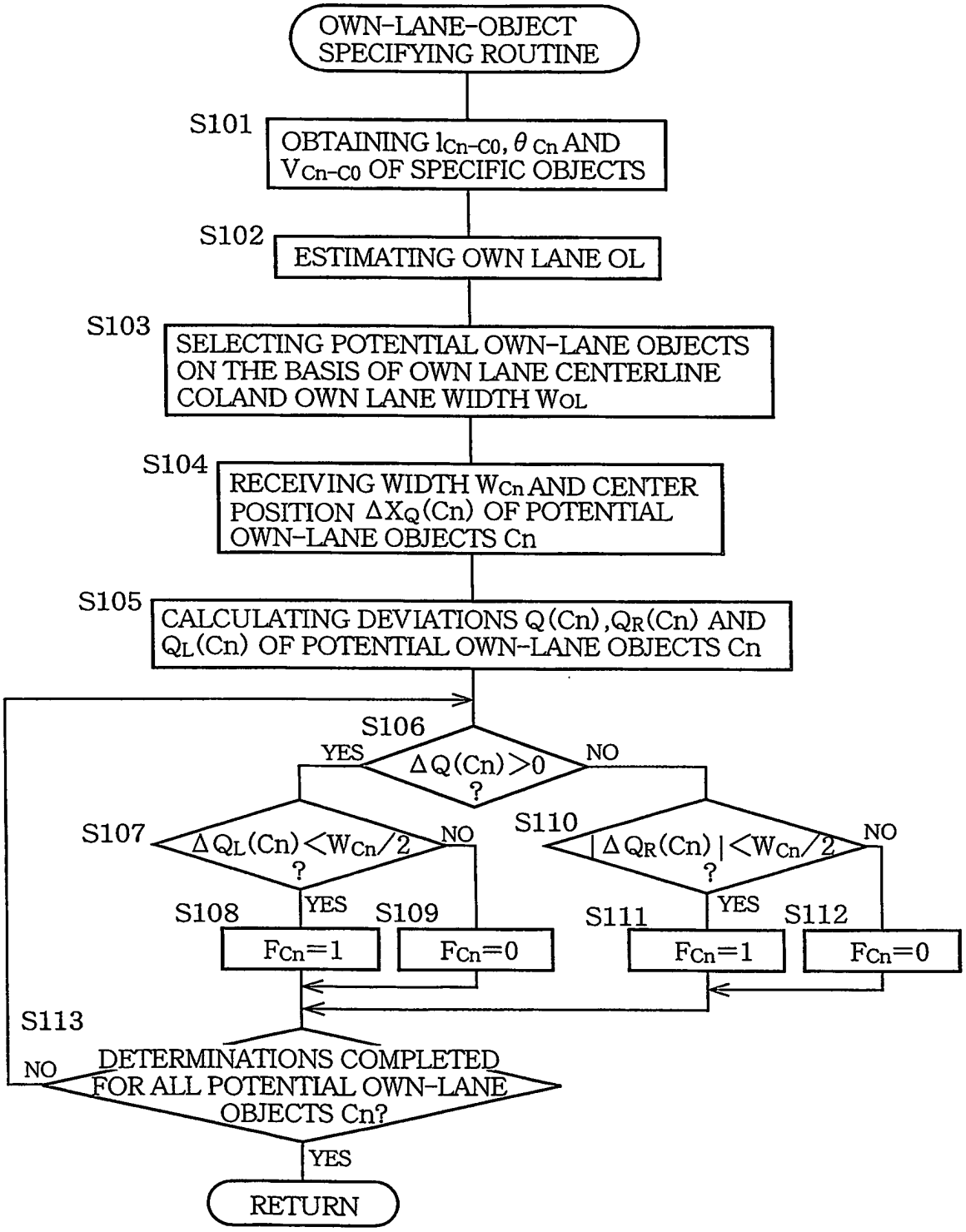

OWN-LANE-OBJECT SPECIFYING ROUTINE
S101
OBTAINING l_{Cn-C0}, θ_{Cn} AND V_{Cn-C0} OF SPECIFIC OBJECTS
S102
ESTIMATING OWN LANE OL
S103
SELECTING POTENTIAL OWN-LANE OBJECTS ON THE BASIS OF OWN LANE CENTERLINE COLAND OWN LANE WIDTH W_{OL}
S104
RECEIVING WIDTH W_{Cn} AND CENTER POSITION $\Delta X_Q(Cn)$ OF POTENTIAL OWN-LANE OBJECTS Cn
S105
CALCULATING DEVIATIONS $Q(Cn)$, $Q_R(Cn)$ AND $Q_L(Cn)$ OF POTENTIAL OWN-LANE OBJECTS Cn
S106
$\Delta Q(Cn) > 0$?
YES
NO
S107
$\Delta Q_L(Cn) < W_{Cn}/2$?
NO
YES
S108
$F_{Cn}=1$
S109
$F_{Cn}=0$
S110
$|\Delta Q_R(Cn)| < W_{Cn}/2$?
NO
YES
S111
$F_{Cn}=1$
S112
$F_{Cn}=0$
S113
DETERMINATIONS COMPLETED FOR ALL POTENTIAL OWN-LANE OBJECTS Cn?
NO
YES
RETURN

FIG.8

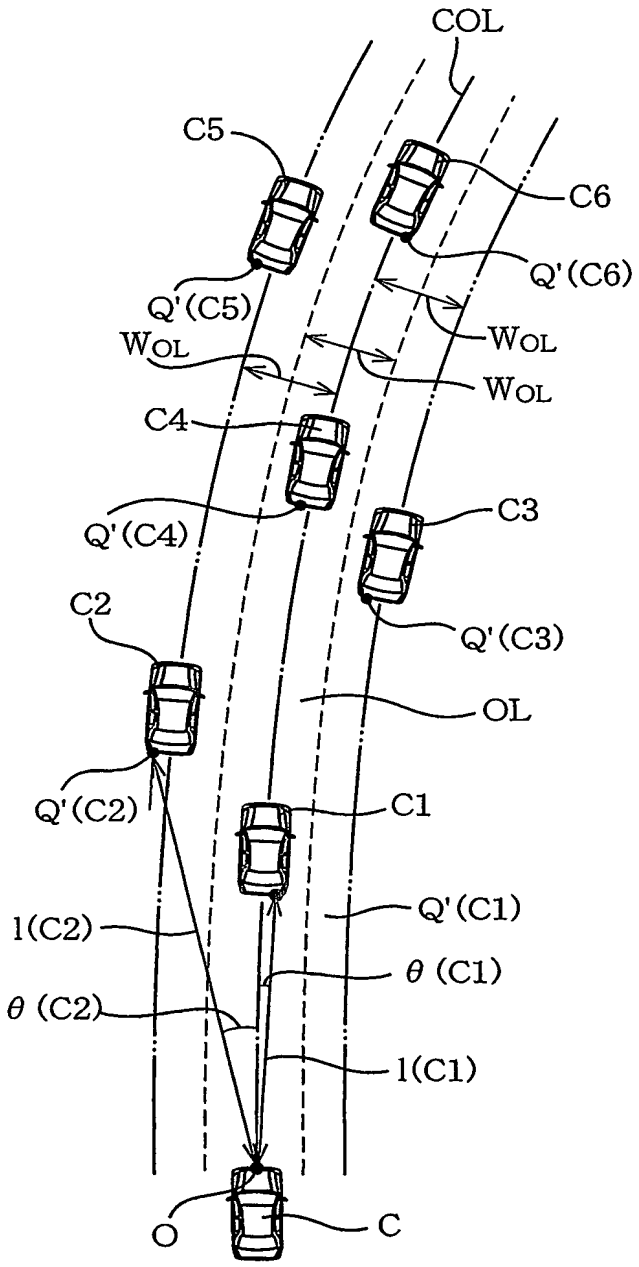

COL
C5
C6
Q'(C6)
Q'(C5)
WOL
WOL
WOL
C4
C3
Q'(C4)
C2
Q'(C3)
OL
Q'(C2)
C1
Q'(C1)
l(C2)
θ (C1)
θ (C2)
l(C1)
O
C

FIG.9A

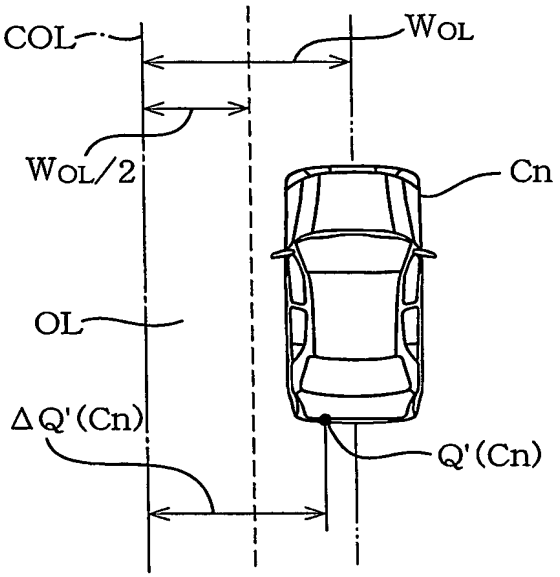


FIG.9B

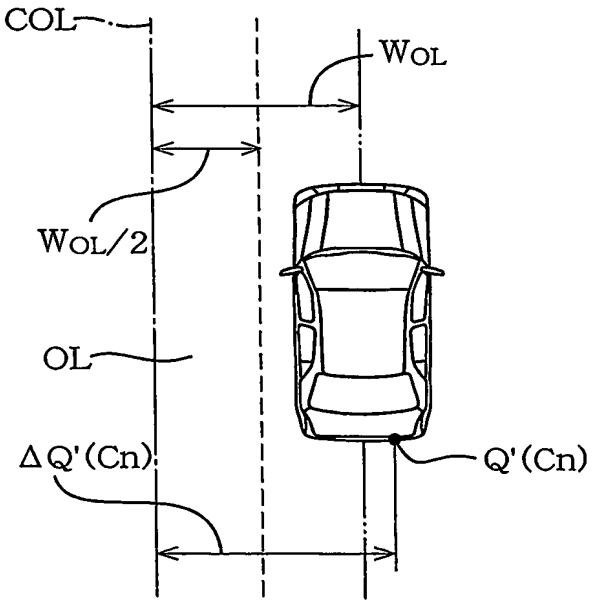
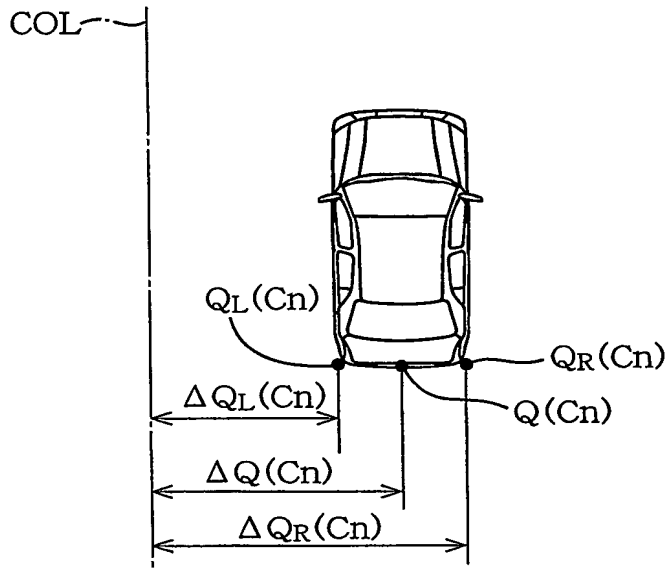


FIG.10



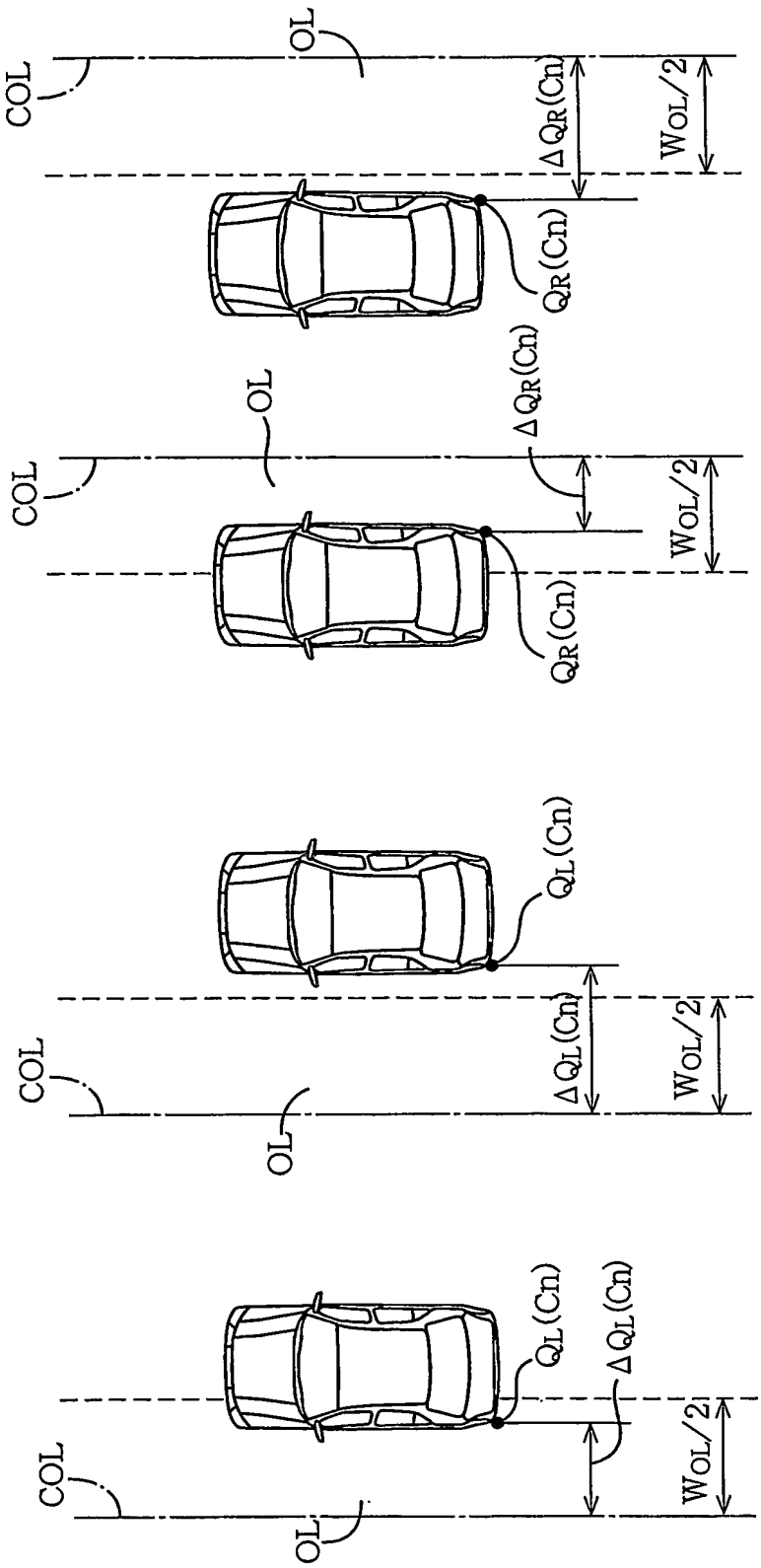


FIG.11A FIG.11B FIG.11C FIG.11D

FIG.12

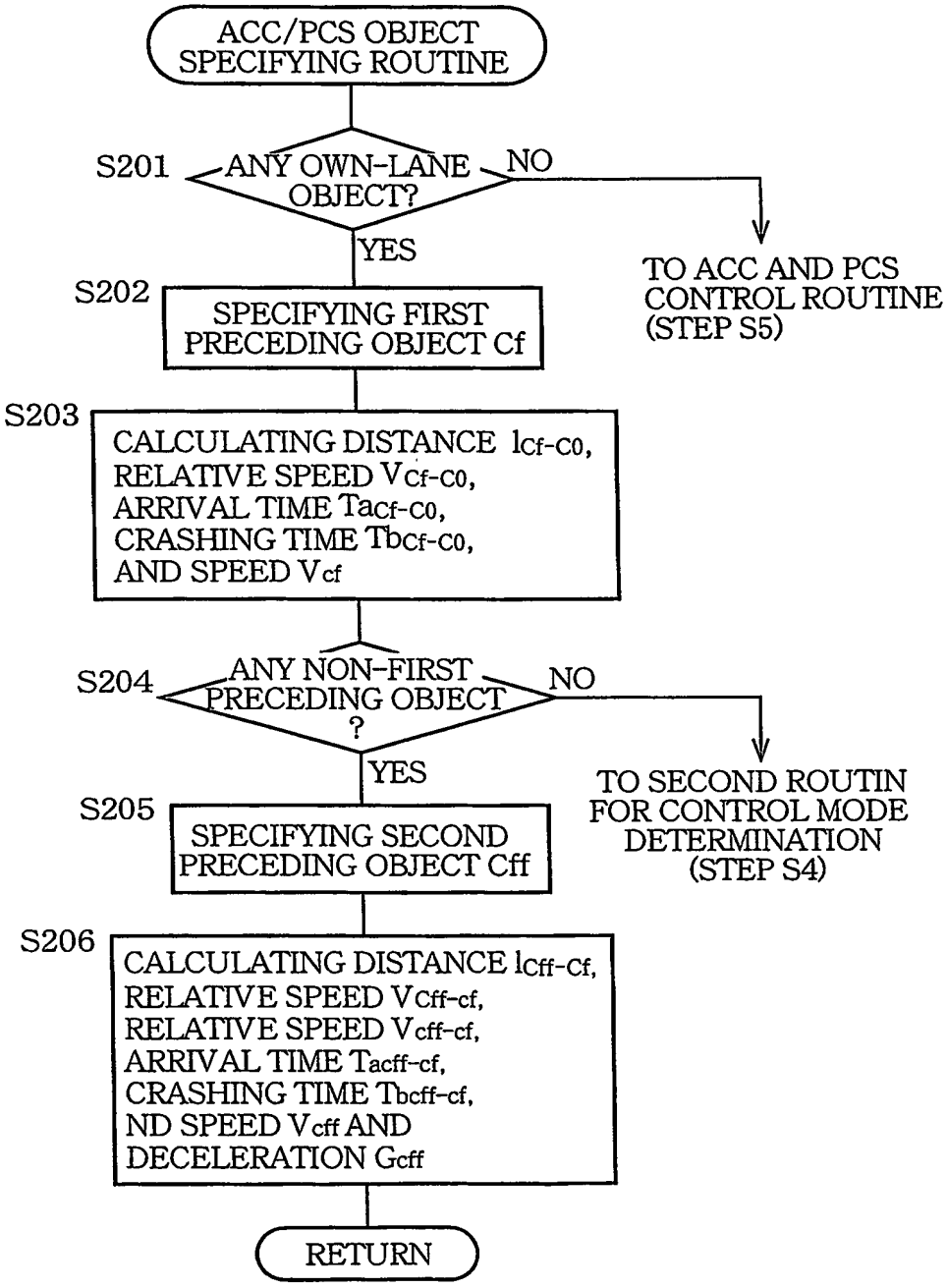

ACC/PCS OBJECT SPECIFYING ROUTINE
S201
ANY OWN-LANE OBJECT?
NO
YES
TO ACC AND PCS CONTROL ROUTINE (STEP S5)
S202
SPECIFYING FIRST PRECEDING OBJECT Cf
S203
CALCULATING DISTANCE lCf-C0, RELATIVE SPEED VCf-C0, ARRIVAL TIME TaCf-C0, CRASHING TIME TbCf-C0, AND SPEED VCf
S204
ANY NON-FIRST PRECEDING OBJECT ?
NO
YES
TO SECOND ROUTIN FOR CONTROL MODE DETERMINATION (STEP S4)
S205
SPECIFYING SECOND PRECEDING OBJECT Cff
S206
CALCULATING DISTANCE lCff-Cf, RELATIVE SPEED VCff-cf, RELATIVE SPEED Vcff-cf, ARRIVAL TIME Tacff-cf, CRASHING TIME Tbcff-cf, ND SPEED Vcff AND DECELERATION Gcff
RETURN

FIG.13

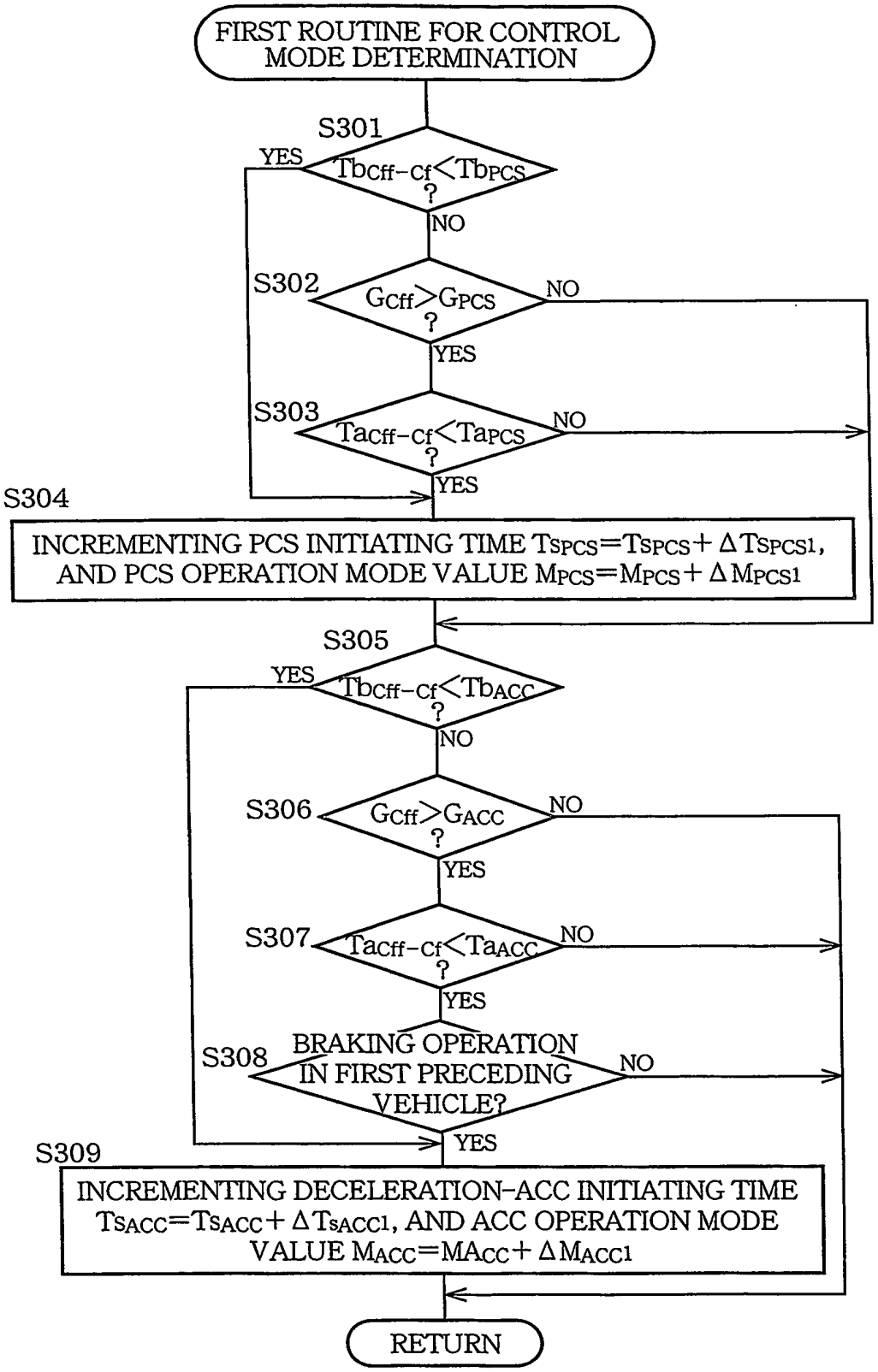
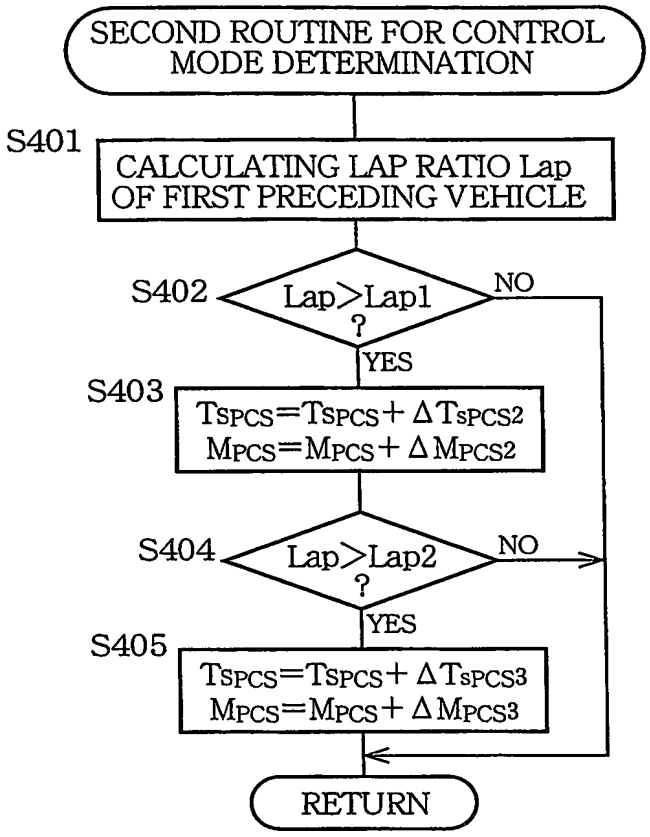
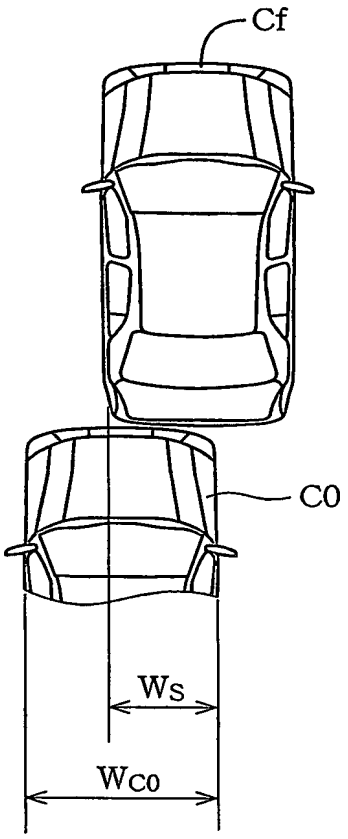

FIRST ROUTINE FOR CONTROL MODE DETERMINATION
S301
YES
Tbcff-cf<TbPCS ?
NO
S302
Gcff>GPCS ?
NO
YES
S303
Tacff-cf<TaPCS ?
NO
YES
S304
INCREMENTING PCS INITIATING TIME TsPCS=TsPCS+ΔTsPCS1, AND PCS OPERATION MODE VALUE MPCS=MPCS+ΔMPCS1
S305
YES
Tbcff-cf<TbACC ?
NO
S306
Gcff>GACC ?
NO
YES
S307
Tacff-cf<TaACC ?
NO
YES
S308
BRAKING OPERATION IN FIRST PRECEDING VEHICLE?
NO
YES
S309
INCREMENTING DECELERATION-ACC INITIATING TIME TsACC=TsACC+ΔTsACC1, AND ACC OPERATION MODE VALUE MACC=MACC+ΔMACC1
RETURN

FIG.14


SECOND ROUTINE FOR CONTROL MODE DETERMINATION
S401
CALCULATING LAP RATIO Lap OF FIRST PRECEDING VEHICLE
S402
Lap>Lap1 ?
NO
YES
S403
TsPCS=TsPCS+ΔTsPCS2
MPCS=MPCS+ΔMPCS2
S404
Lap>Lap2 ?
NO
YES
S405
TsPCS=TsPCS+ΔTsPCS3
MPCS=MPCS+ΔMPCS3
RETURN



Lap(%)=Ws/Wc0×100%

FIG.15A

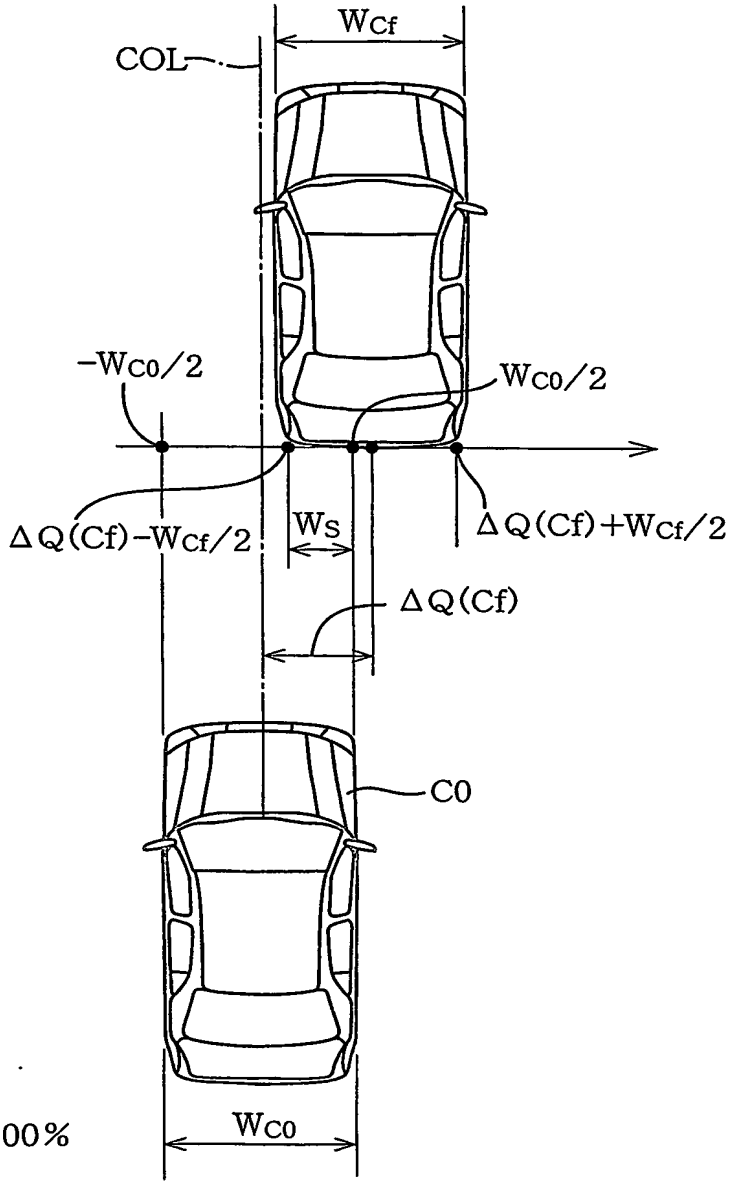


FIG.15B

FIG.16

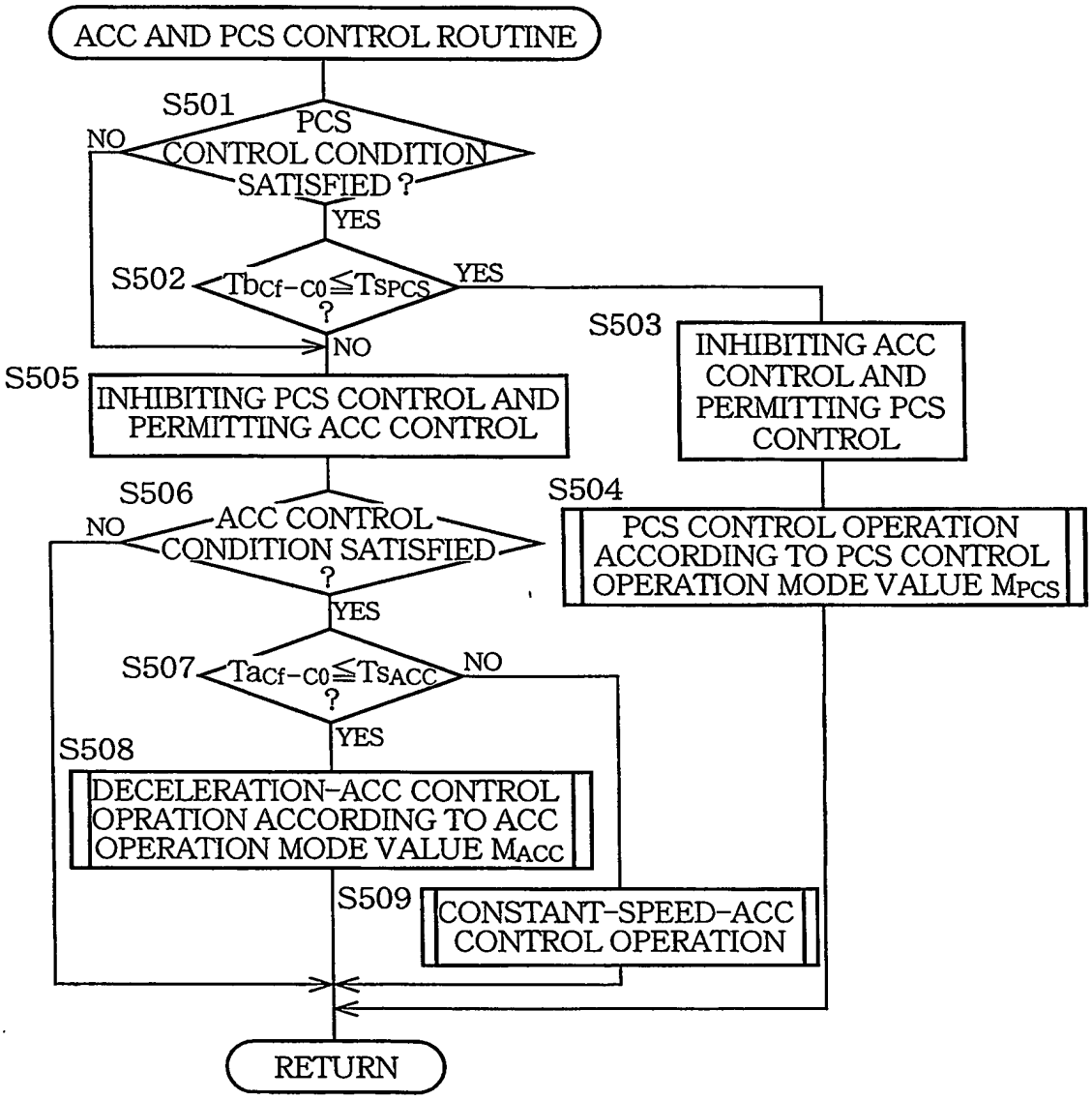
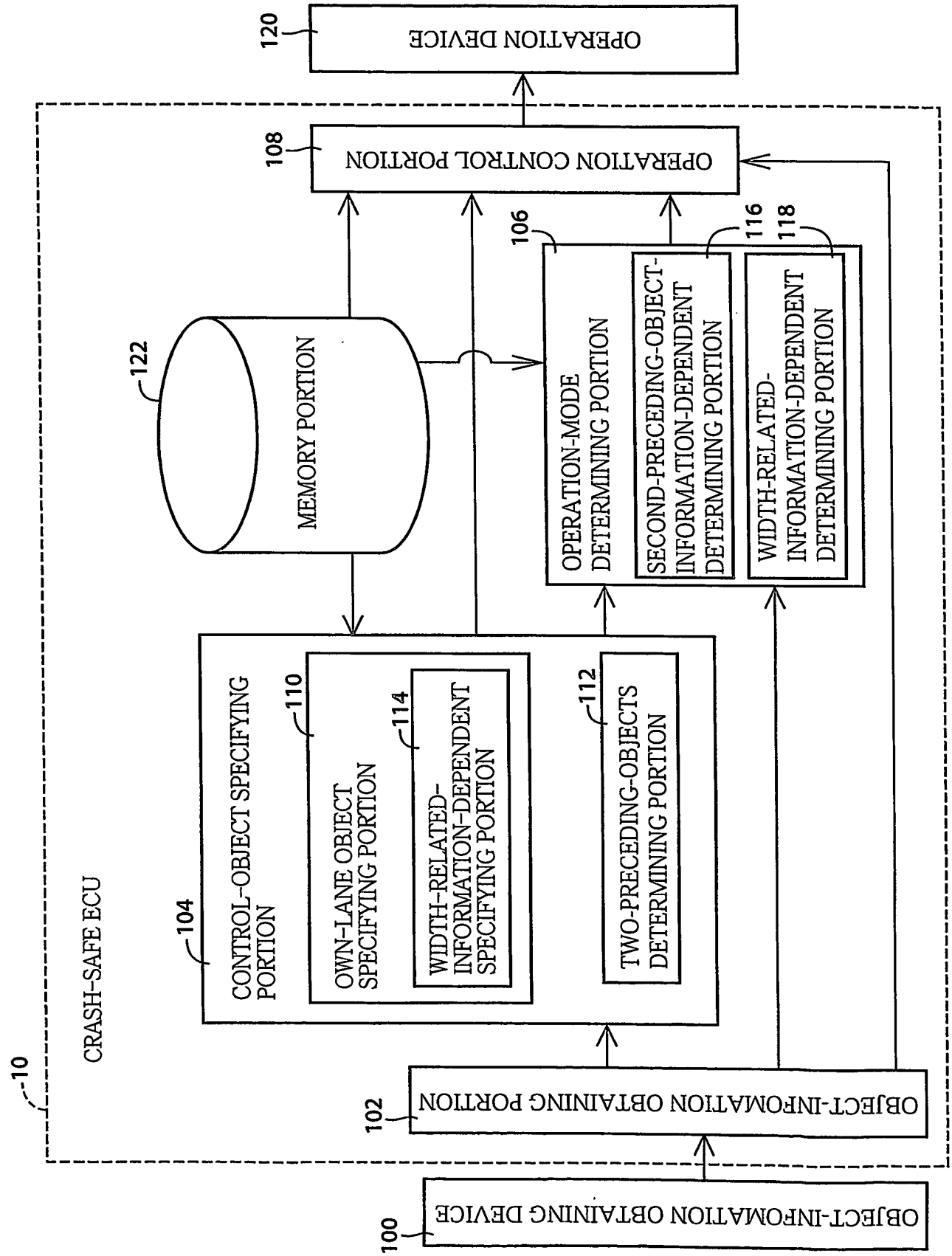

ACC AND PCS CONTROL ROUTINE
S501
PCS CONTROL CONDITION SATISFIED ?
NO
YES
S502
Tbcf-c0≦TsPCS ?
YES
NO
S503
INHIBITING ACC CONTROL AND PERMITTING PCS CONTROL
S505
INHIBITING PCS CONTROL AND PERMITTING ACC CONTROL
S504
PCS CONTROL OPERATION ACCORDING TO PCS CONTROL OPERATION MODE VALUE MPCS
S506
ACC CONTROL CONDITION SATISFIED ?
NO
YES
S507
Tacf-c0≦TsACC ?
NO
YES
S508
DECELERATION-ACC CONTROL OPRATION ACCORDING TO ACC OPERATION MODE VALUE MACC
S509
CONSTANT-SPEED-ACC CONTROL OPERATION
RETURN

FIG.17


OBJECT-INFOMATION OBTAINING DEVICE
100
OBJECT-INFOMATION OBTAINING PORTION
102
CRASH-SAFE ECU
10
CONTROL-OBJECT SPECIFYING PORTION
104
OWN-LANE OBJECT SPECIFYING PORTION
110
WIDTH-RELATED-INFORMATION-DEPENDENT SPECIFYING PORTION
114
TWO-PRECEDING-OBJECTS DETERMINING PORTION
112
OPERATION-MODE DETERMINING PORTION
106
SECOND-PRECEDING-OBJECT-INFORMATION-DEPENDENT DETERMINING PORTION
116
WIDTH-RELATED-INFORMATION-DEPENDENT DETERMINING PORTION
118
MEMORY PORTION
122
OPERATION CONTROL PORTION
108
OPERATION DEVICE
120